Add

Figures 5a-b are diagrams showing an optical element according to a fourth embodiment of the invention.

Specification at page 10, line 10:

Figures 6a-b are diagrams showing an optical element according to a fifth embodiment of the invention.

AE

Figures 11a-f are diagrams showing the prior art method of fabrication of an optical element.

Respectfully Submitted,

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Enclosures: Version with Markings to Show Changes Made
Dated: August 22, 2001

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Kathleen Libby

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

SPECIFICATION:

Specification at page 4, line 13:

~~The 1st invention~~ One aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a material which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 4, line 23:

~~The 2nd invention~~ Another aspect of the present invention is an optical element ~~according to 1st invention~~, the refractive index in a part of said material varies substantially periodically or is substantially continuously monotone increasing or decreasing in the direction substantially perpendicular to said direction of light propagation.

Specification at page 5, line 4:

~~The 3rd invention~~ Still another aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a material which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 5, line 14:

~~The 4th invention~~ Yet still another aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a resin which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 5, line 23:

~~The 5th invention~~ Still yet another aspect of the present invention is an optical element according to 4th invention, said part of resin the refractive index of which varies is formed using the photo-hardening or thermo-hardening property of said resin.

Specification at page 6, line 2:

~~The 6th invention~~ A further aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a material which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 6, line 13:

~~The 7th invention~~ A still further aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a material which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 6, line 24:

~~The 8th invention~~ A yet further aspect of the present invention is an optical element comprising: a substrate having or not having a channel for optical waveguide; and a material which has a refractive index higher than that of said substrate and is filled in said channel for optical waveguide or is disposed on said substrate; wherein

Specification at page 7, line 11:

~~The 9th invention~~ A still yet further aspect of the present invention is an optical element ~~according to 8th invention~~, wherein said protruding parts are provided substantially periodically.

Specification at page 7, line 14:

~~The 10th invention~~ An additional aspect of the present invention is an optical element ~~according to any one of 1st, 2nd, 3rd, 6th, 7th, 8th and 9th inventions,~~, wherein said material is composed of glass material or resin.

Specification at page 7, line 18:

~~The 11th invention~~ A still additional aspect of the present invention is in a method of fabrication of optical element, wherein photo-hardening resin is formed in a substrate, and wherein light is irradiated onto said photo-hardening resin, thereby hardening said photo-hardening resin, a

method of fabrication of optical element wherein the amount of said light irradiated onto the surface of said photo-hardening resin is varied.

Specification at page 7, line 25:

~~The 12th invention~~ A yet additional aspect of the present invention is a method of fabrication of optical element ~~according to 11th invention~~, wherein the amount of said light irradiation is varied substantially periodically or is substantially continuously monotone increasing or decreasing, in a predetermined direction on the surface of said photo-hardening resin.

Specification at page 8, line 6:

~~The 13th invention~~ A still yet additional aspect of the present invention is a method of fabrication of optical element ~~according to 11th or 12th inventions~~, wherein the intensity of said light irradiation onto said photo-hardening resin is varied, whereby the amount of said light irradiation onto the surface of said photo-hardening resin is varied.

Specification at page 8, line 12:

~~The 14th invention~~ A supplementary aspect of the present invention is a method of fabrication of optical element ~~according to 13th invention~~, wherein a mask having partially different light transmissivity is used, whereby the intensity of said light irradiation onto the surface of said photo-hardening resin is varied.

Specification at page 8, line 17:

~~The 15th invention~~ A still supplementary aspect of the present invention is a method of fabrication of optical element ~~according to 11th or 12th inventions~~, wherein a light shielding plate is used so as to sequentially change the region irradiated by said light, whereby the amount of said light irradiation onto is varied.

Specification at page 8, line 22:

~~The 16th invention~~ A yet supplementary aspect of the present invention is in a method of fabrication of optical element, wherein photo-hardening resin is formed in a substrate, and wherein light is irradiated onto said photo-hardening resin, thereby hardening said photo-hardening resin, a method of fabrication of optical element, wherein another optical component is connected to said photo-hardening resin, and then said photo-hardening resin is hardened, whereby said optical component is fixed to said photo-hardening resin.

Specification at page 9, line 6:

~~The 17th invention~~ A still yet supplementary aspect of the present invention is a method of fabrication of an optical element ~~according to any one of 1st to 7th inventions~~, wherein said channel for optical waveguide in said substrate is formed in a integrated manner using a mold having protrusion and recess in the surface thereof.

Specification at page 9, line 11:

~~The 18th invention~~ Another aspect of the present invention is a method of fabrication of an optical element ~~according to 8th or 9th inventions~~, wherein the protrusion and recess in said substrate of said optical element is formed in a integrated manner using a mold having protrusion and recess in the surface thereof.

Specification at page 9, line 19:

Figures 1a-b are ~~is a~~ diagrams showing an optical element according to a first embodiment of the invention.

Specification at page 9, line 22:

Figures 2a-b ~~is a~~ are diagrams showing the function of an optical-waveguide type diffraction grating according to a first embodiment of the invention.

Specification at page 10, line 1:

Figures 3a-d ~~is a~~ are diagrams showing an optical element according to a second embodiment of the invention.

Specification at page 10, line 7:

Figures 5a-b ~~is a~~ are diagrams showing an optical element according to a fourth embodiment of the invention.

Specification at page 10, line 10:

Figures 6a-b ~~is a~~ are diagrams showing an optical element according to a fifth embodiment of the invention.

Figures 11a-f ~~is a~~ are diagrams showing the prior art method of fabrication of an optical element.